including the violet, blue and green rays. The exciting rays capable of bringing about fluorescence extend from the ultra-violet to the blue-green part of the spectrum up to about the line *F* and the spectrum of the fluorescent radiation includes the blue-green, green and yellow-green part of the spectrum. There is here therefore some overlapping of the absorption band and the emission spectrum.

According to the views at present held by physicists the light absorbed, both in phosphorescent and in fluorescent substances, brings about a partial or complete separation of electrons from the atoms of the substances acted upon. Both fluorescence and phosphorescence are therefore to be regarded as photo-electric phenomena*.

In the Fungi phosphorescence appears to be due to the activities of living cells, but fluorescence is only visible in solutions of the colouring matter extracted from the plant by solvents.

A REVISION OF THE BRITISH CLAVARIAE.

By A. D. Cotton, F.L.S., and E. M. Wakefield, F.L.S.

INTRODUCTION.

The work on which the present revision is based was begun in 1905. It was originally intended to include in the study all the described species of Clavaria, numbering now about 400, and to publish a systematic monograph of the whole genus. As the work progressed however it became apparent that, before any attempt could be made to monograph the genus, it was essential to clear up the confusion which existed with regard to the old European species.

Microscopic structure had shown new ways of distinguishing species and also that several undescribed species occurred even in Britain. It was obvious, therefore, that it was only by prolonged and careful field work, coupled with an investigation of the micro-characters, that a true understanding of the genus could be obtained and the old descriptions and original specimens be correctly interpreted.

As a result of this preliminary work it was decided to limit the revision in the first place to the British species, but to include during the investigation as many continental and extra-European species as came to hand, with a view to publishing a monograph at a later date. The present revision does not profess to furnish a complete list of the British species. Indeed it is clearly preliminary, since many specimens had to be left unidentified, and species apparently new continue to appear every season. We feel confident however that the interpretation here given of the old and doubtful species is in the main correct and that, though new species may be added, little fundamental alteration will be necessary. As it has not been possible to pay detailed attention to the subject since 1914, and as there is no prospect of doing so in the immediate future, it seems advisable to publish without further delay the results so far obtained.

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* Allen, Photo-electricity.

With regard to the diagnostic characters adopted, we have used micro-characters in conjunction with field characters. The form and size of the spore, except in the ochraceous-spored section where they are singularly uniform, proved surprisingly varied and useful. But although so invaluable we have never used micro-characters in separating one species from another unless the plant was also amply distinct in form, colour, or other field character. The spores in some cases afford a more accurate and precise means of expressing the difference between allied species than form or colour. This is well seen in the yellow unbranched section and especially in the case of the two species *C. inaequalis* and *C. persimilis*. To the trained eye these are usually distinguishable in the field, but at times the colour is identical. If examined with the microscope, however, the oblong spore of the latter with its marked lateral apiculus immediately separates it from the globose spinose spore of the former, and if the specimens are sorted out by this method the separation is confirmed by the difference in colour which is assumed on drying.

The variation of the spore both in form and size, and hence the difficulty in gauging its value as a diagnostic character, has been commented on by several writers, both systematists and experimentalists, e.g. Sherbakoff in the case of Fusarium, Brierley in Botrytis, and by Thom to a lesser extent in the case of Penicillium. The present study has not revealed any marked variation in the genus Clavaria, but merely that which any systematist would consider normal for the Hymenomycetes and indeed for the larger fungi generally. The spores of all species of Clavaria vary within certain limits, and those of some species much more so than others; indeed the tendency to great variation may be regarded as characteristic of certain species. In connection with spore-measurements two points must be borne in mind, (1) the necessity of dealing with mature spores and (2) the possibility of the existence of strains or races which may differ in several respects from the typical species. With regard to the former, for ordinary systematic purposes the use of the usual spore-cast provides a sufficiently good safeguard, although the possibility of obtaining exceptional spores is not excluded by this method (see, for instance, these Trans. vol. iv. pp. 298–300). With reference to strains, the existence of these in many parasitic species has been definitely proved, and though perhaps less general it occurs also amongst the Hymenomycetes, as has been shown with respect to the formation of fruit-bodies in *Schizophyllum commune* and *Stereum purpureum* (Naturwiss. Zeitschr., 1909, p. 521). It will be noted that the fungi alluded to above (Fusarium, etc.) are Hyphomycetes and it would appear that, owing perhaps to the great diversity of substrata on which they exist, they are more liable to vary than the Hymenomycetes.

The list as given in the present revision consists of 37 species. Two of these, *C. Broomei* and *C. Invalii*, we have been compelled to describe as new, and four other novelties were described during the progress of the work, viz., *C. gigaspora*, *C. Crosslandii*, *C. straminea* and *C. persimilis*. In two cases only has it been necessary by following the International Rules of Nomenclature to change a name. *C. muscoides* Linn. becomes *C. corniculata* Fr., and *C. conchyliata* Allen becomes *C. Bizzozeriana* Sacc. One plant usually listed in British works as a species, *C. fastigiata*, is reduced to the rank of a variety (*C. corniculata* var. *pratensis*) and 22 names have been excluded from the British list as synonyms or indeterminable.

With regard to the citation of synonyms and illustrations the list, though fairly full, does not profess to be completely exhaustive. Well-known names have in all cases been cited, but doubtful names have been omitted. Of illustrations, those occurring in British works have been quoted, and a selection has been made from other works, choosing those which are well known and best represent the species in question.

Before closing this introduction we would acknowledge our indebtedness to all who have helped the work by forwarding specimens. Many of the species are so rare in this country that but for their aid there would have been little chance of examining fresh material. As practically every working member of the British Mycological Society has helped in this way, it is impossible to mention each one individually. The late Mr. G. Massee suggested the work and liberally handed over a number of notes and drawings. Mr. Carleton Rea's help was invaluable, and we are indebted to Mrs. Rea for the loan of her matchless collection of paintings together with notes. Amongst other members of the Society who have whole-heartedly helped mention may be made of Mr. C. Crossland, the Rev. W. L. W. Eyre, Miss A. Fry, Mr. C. H. Spencer Perceval, and Mr. E. W. Swanton. We have also received specimens from American, French, Swiss and German botanists, whilst the Abbé G. Bresadola was always ready to supply specimens and notes from the Austrian Tyrol. For a collection of specimens from the classical ground near Upsala we are indebted to Mr. C. G. Lloyd. To these mycologists and to all others not mentioned by name we record our sincere thanks.

In the case of certain rare species we have indicated the localities. These are limited to Britain and include only those from which material has been received during the preparation of this revision. No attempt has been made to investigate the specimens contained in the public and private herbaria of this country.

KEY TO THE BRITISH SPECIES OF CLAVARIA.

A. Plants branched.	
1. Plants when mature more or less yellowish, spores ochraceous.	
(*a*) Plants large, up to 10 or 15 cm. high; spores 9–20µ long.	
Plant fragile, pale when dry; spores pale ochraceous, minutely granular, 11–14 × 4–5µ	1. *C. flava*
Plant somewhat fragile, dark when dry; spores deep ochraceous, echinulate, 15–16 × 6–7µ	2. *C. Broomei*
Plant white to ochraceous, tips of branches rosy; spores striate or reticulate	3. *C. botrytis*
Plant buff-pink, tips of branches yellow; spores minutely granular ...	4. *C. formosa*
(*b*) Plants medium-sized, up to 5 cm. high; spores 6–10µ long.	
Growing on wood, vinous to brownish yellow	5. *C. stricta*
Growing on the ground in coniferous woods	
Plant turning green when bruised	6. *C. abietina*
Plant not turning green when bruised	
Plant slender, flaccid; spores 6–7 × 3µ	7. *C. flaccida*
Plant stout, rigid; spores 7–9 × 4µ	8. *C. Invalii*
2. Plants variously coloured, spores hyaline.	
(*a*) Plants white.	
Branches cristate; spores large, subglobose, 9–12 × 6–8µ	9. *C. cristata*
Branches not cristate; spores small, globose, 3–5µ	10. *C. Kunzei*
(*b*) Plants greyish.	
Spores subglobose, 7–10 × 6–8µ ...	11. *C. cinerea*
Spores very large, pip-shaped, 12–16 × 7·5–8µ	12. *C. gigaspora*

(*c*) Plants violet.

Plant medium sized, fleshy; spores subglobose, 5–7μ ... ... 13. *C. amethystina*

Plant very small, slender; spores globose, 2·5–3·5μ ... ... 14. *C. Bizzozeriana*

(*d*) Plants clear yellow; spores subglobose, 6–7μ ... ... 15. *C. corniculata*

(*e*) Plants pale umber, spores pip-shaped, 5–6 × 3–4μ ... ... 16. *C. umbrinella*

B. Plants simple (occasionally branched in 21).

1. Plants tufted.

Plant white; spores subglobose, 3–5 × 3–4μ 17. *C. vermicularis*

Plant grey; spores elliptical or pip-shaped, 6–8 × 3–4μ ... ... 18. *C. fumosa*

Plant yellow; spores globose, 5–7μ ... ... 19. *C. fusiformis*

2. Plants solitary or in small groups.

(*a*) Plants white.

Plant very slender, smooth; spores subglobose, 8–9 × 7–8μ ... ... 20. *C. acuta*

Plant stout, rugose, sometimes branched; spores subglobose, 9–11 × 8–9μ ... ... 21. *C. rugosa*

Plant small, slender; spores aculeate, globose, 7–8μ (without spines) ... 22. *C. asterospora*

(*b*) Plants drab or greyish.

Plant with a distinct stalk, thickened above; spores ovoid, 8 × 4μ ... 23. *C. tenuipes*

Plant slender, brittle, without a distinct stalk; spores small, pip-shaped, 4–5 × 2–3μ ... ... 24. *C. Crosslandii*

(*c*) Plants reddish or purple.

Plant bright rose-pink ... ... 25. *C. rosea*

Plant purplish-brown ... ... 26. *C. purpurea*

Plant dingy flesh-colour or pale chocolate ... ... 27. *C. incarnata*

(*d*) Plants yellow.

Spores aculeate ... ... 28. *C. inaequalis*

Spores smooth.

Plant straw-coloured, becoming brownish when bruised, apex usually acute; spores globose, 5–7μ 29. *C. straminea*

Plant greenish-yellow, not becoming brownish when bruised, apex usually blunt; spores 10–11 × 5–6μ ... ... 30. *C. argillacea*

Plant apricot-yellow, pale buff when dry; spores ovoid, 6–7 × 3μ 31. *C. luteo-alba*

Plant orange-yellow, darker when dry; spores subglobose to oblong, 5–6 × 4μ ... ... 32. *C. persimilis*

(*e*) Plants ochraceous to brownish.

Plant very large and stout, clavate, dingy yellow to brown ... ... 33. *C. pistillaris*

Plant medium sized, up to 1·25 cm. thick, ochraceous ... ... 34. *C. ligula*

Plant very long, subulate, pale yellow to rusty, growing on branches; spores 10–17 × 7–9μ ... ... 35. *C. fistulosa*

Plant short, contorted, erumpent, on branches of Alder; spores 17–23 × 8–10μ ... ... 36. *C. contorta*

Plant filiform, rusty to brownish; spores 8–11 × 4–5μ ... ... 37. *C. juncea*

A. PLANTS BRANCHED.

1. *Plants when mature more or less yellowish, spores ochraceous.*

(*a*) Plants large, up to 10 or 15 cm. high; spores 9–20μ long.

1. CLAVARIA FLAVA *Fr.*, Syst. Myc. i. p. 467; Maire in Bull. Soc. Myc. Fr. xxvii. 1911, p. 450.

C. flava Pers., Comment. p. 43; *Ramaria coralloides flava* seu *lutea* Holmsk., Beata ruris, 1790, p. 117; *C. sanguinea* Pers., Obs. Myc. ii. 1799, p. 61, tab. 3, fig. 3; *C. lutea* Venturi, Mic. Bresc. tab. 41, fig. 4.

Illustrations: Holmsk., Fung. Dan. i. tab. 31; Pers., Obs. Myc. ii. tab. 3, fig. 3; Schaeff., Icon. Fung. tab. 175; Barla, Champ. Nice, tab. 40, fig. 5; Bres., Fung. Mang. tab. 100; Fries, Sver. Atl. Svamp. tab. 26; Schaeff., Icon. Fung. tab. 175; Vittadini, Fung. Mang. tab. 29, figs. 2, 3; Venturi, loc. cit.

Plants large, branched, 8–13 cm. high, fleshy, fragile, ochraceous, becoming paler on drying and reddish when bruised; smell pleasant, taste mild. *Stem* thick, white or tinged reddish. *Branching* irregular or irregularly dichotomous, repeated, axils acute, not flattened; branches slender, cylindrical, erect, solid, smooth or slightly wrinkled, apices blunt or pointed. *Flesh* white, soft. *Internal structure* of slightly interwoven hyphae, 8–12μ in diameter, sub-parenchymatous in transverse section. *Basidia* 45 × 10μ, finely granular; sterigmata 4, erect. *Spores* pale ochraceous in the mass, almost hyaline by transmitted light, narrowly elliptical, incurved at the base, walls slightly granular, 11–14 (–15) × 4–5μ.

Habitat. On the ground, in both coniferous and frondose woods.

Rare. Specimens from Morpeth (C. H. Spencer Perceval, 1906, 1909); Bodmin (A. D. C., 1906); Tobermoray, Isle of Mull (A. D. C., 1910); New Forest (G. Massee, 1903, and [Lyndhurst] A. D. C., 1916).

Of the three large species of Clavaria found in Britain this is the least rare. It appears to be not infrequent also on the Continent, at all events in France and Switzerland. It is found in both coniferous and frondose woods (especially beech), where it occurs either isolated or in groups as a pale fragile plant, with a marked tendency to become reddish at the base or when bruised. The colour is pale ochraceous, paler and yellower than in *C. formosa*, which has a tendency to become dull pink.

The correct identity of the three species, *C. flava* Pers., *C. formosa* Pers., and *C. aurea* Fr. is a very perplexing problem, and one which owing to the scarcity of authentic material and meagreness of the original descriptions it is perhaps impossible to solve. There can be little doubt that the plant here referred to as *C. flava* is the same as that described by Persoon under the same name, and in this view we have the support of Maire (loc. cit.). In this country it has been usually referred to as *C. aurea*, an error which arose largely as the result of Fries' statement that *C. aurea* differed from *C. flava* in its ochraceous spores. This was incorrect, as in all the species of this section the spores are coloured, though in some species more so than in others.

With regard to *C. aurea* it is difficult to dogmatise as to its identity. The English specimens so named consist as stated above for the most part of *C. flava*, but a few which as far as can be seen from herbarium material only differ in possessing shorter spores may be distinct also in other characters, and these may possibly represent the *C. aurea* of Fries. Until the Swedish species of Clavaria have been critically worked out it is advisable not to attempt to describe the plant or list the species for Britain.

2. C. BROOMEI *Cotton et Wakefield*, sp. nov.

Sporophorum ramosum, circa 5–8 cm. altum, 2–4 cm. diametro, haud fragile, ochraceo-aurantiacum, apicibus aurantiacis, tactu brunnescens, basi albidum. *Stipes* brevis, albidus, tactu rubescens, vix radicans. *Ramuli* subdichotomi, cylindrici vel compressi, breves, solidi, erecti, laeves vel rugulosi, apicibus compressis. *Caro* solida, alba, demum vinosa. *Hyphae* 3–6 μ diametro, dense aggregatae. *Basidia* 40–50 × 8–9 μ, granulosa, 2-sterigmatica. *Sporae* copiosae, fulvo-ochraceae, oblique fusiformes, aculeatae, 14–20 × 6–8 μ.

Habitat. Ad terram in silvis. Warleigh Common, near Bath, C. E. Broome, 1866; Batheaston, C. E. Broome; Meathop Fell, near Grange, Westmorland, chiefly under Holly, collected by J. Wilfrid Jackson, and forwarded by Harold Murray, 1909 and 1911.

Plants somewhat branched, medium to large, 5–8 cm. high, 2–4 cm. across, rather tough, ochraceous orange, tips darker orange, turning brown easily on bruising, base white or pinkish; smell slight, not pleasant, taste bitter. *Stem* short, not swollen, white, becoming pinkish on bruising; rooting base small. *Branching* irregular or somewhat dichotomous, slight below, more frequent above, axils not rounded; branches cylindrical or flattened, short, solid, fairly erect, smooth, or the larger branches much wrinkled, tips flattened. *Flesh* solid, white, becoming vinous later, especially below. *Internal structure* composed of fine filaments, densely packed, slightly interwoven, 3–6μ in diameter, with vesicular ends 10–12μ in diameter, not pseudoparenchymatous in transverse section; large crystals present in abundance in the tissue. *Basidia* not conspicuous, 40–50 × 8–9μ, contents granular; sterigmata 2. *Spores* deep ochraceous or even orange in the mass, copious, obliquely fusiform or pip-shaped, markedly aculeate, 14–20 × 6–8μ (average 15–16 × 6–7μ).

This species is clearly allied to *C. formosa*, but it is distinguished from it and still more from *C. flava* by its darker hue, and by the deeply coloured and distinctly aculeate spores. On drying it becomes nearly black in colour, whereas *C. formosa* and *C. flava* remain pale, and are somewhat more brittle. It is not possible to identify this species with Fries' *C. aurea*, the spores being quite different from those of an authentic specimen of *C. aurea* in the Kew Herbarium: moreover among all the specimens so named from the Continent not one has been found agreeing with *C. Broomei*.

There can be no question that the specimens forwarded by Mr. Harold Murray agree with those collected by Broome in 1866. These latter were named *C. formosa* by Berkeley, and were distributed under this name by M. C. Cooke in Fungi Britannici Exsiccati (No. 230 and Ed. 2, No. 411). The first record of *C. formosa* as British was made by Berkeley and Broome in 1865 (Ann. and Mag. of Nat. Hist. ser. iii. 15, 1865, p. 321, No. 1031). It was based on specimens collected by Broome at Bathford Down, but although these specimens have not been found, from the description of the spores as "buff, broadly fusiform, granulated," there is little doubt that the species in question was *C. Broomei* and not *C. formosa*.

C. Bataillei Maire (Ann. Myc. xi. 1913, p. 351) has also verrucose spores, but they are smaller and paler than those of the present species, and the plant differs in the violet colour of the branches. *C. testaceo-flava* Bres. is distinguished by the smaller basidia and spores, and by the fact that the spores are minutely granular, not distinctly aculeate.

3. C. BOTRYTIS *Fr.*, Syst. Myc. i. p. 466; Bourdot & Galzin in Bull. Soc. Myc. Fr. xxvi. 1910, p. 213; Maire in Bull. Soc. Myc. Fr. xxvii. 1911, p. 449.

C. botrytis Pers., Comment. p. 42; *C. plebeja* Wulf., in Jacq. Misc. Aust. 2, p. 101, tab. 13; *Ramaria coralloides apicibus purpureis* Holmsk., Beata ruris, 1790, p. 117; *C. acroporphyria* Schaeff., Icon. Fung. tab. 176; *C. rufescens* Schaeff., ibid. tab. 288; *C. purpurascens* Paulet, Traité des champ. tab. 194, fig. 6.

Illustrations: Pers., loc. cit. tab. 3, fig. 3; Atkinson, Mushrooms, p. 201, fig. 202; Badham, Esc. Fung. tab. 16, fig. 2 (*C. coralloides*); Barla, Champ. Nice, tab. 40, figs. 1–3; Bres., Fung. Mang. tab. 101; Fries, Sverig. Atl. Svamp. tab. 35; Gillet, Champ. Fr. tab. 507; Holmsk., Fung. Dan. i. 1799, tab. 32, fig. *b*; Krombh., Abbild. u. Beschreib. tab. 53, figs. 1–3; Paulet, loc. cit.; Schaeff., loc. cit.; Migula in Thomé, Flora von Deutschl. iii. 2, 1, tab. 24D, figs. 2, 3 (but spores not correct); Vittadini, Fung. Mang. tab. 29, fig. 1; Weberbauer, Pilze, tab. 10, fig. 1.

Plants large, 10–12 cm. across and 7–12 cm. high, forming fleshy rounded masses, with a short stout base, densely branched above, white to buff, the tips of the branches reddish; smell slight, pleasant, taste pleasant. *Stem* short, stout, white tapering below. *Branching* irregular, primary branches few and stout (2–3 cm.), ultimate branches slender (2–3 mm.), more or less dichotomous; branches cylindrical, somewhat erect, smooth, pruinose, apices pointed or toothed. *Flesh* solid, white. *Internal structure* of parallel septate hyphae, cells 100–150 × 10μ in the centre, smaller towards the margin, scarcely parenchymatous in transverse section. *Basidia* long, conspicuous, 60–70 × 8–10μ, contents very granular; sterigmata 2–4. *Spores* dull ochraceous in the mass, copious, obliquely elliptical, apiculate, smooth, but with fine longitudinal or oblique striations often anastomosing to form a network, 12–16 × 4–5μ.

Habitat. On the ground amongst leaves in woods. Very rare. Specimens from Haslemere (E. W. Swanton, 1905, 1906, 1913); Byfleet (Lady Davy, 1912); Effingham, under beech and holly (A. D. C., 1913); Lyndhurst (A. D. C., 1916).

As remarked by Persoon, the habit of this species is very variable. The typical form is white or pale, and has short, densely crowded, rose-tipped branches, forming a compact rounded mass. With age it becomes more yellowish in colour, and under certain conditions the branches may become much elongated, as figured by Barla, tab. cit. fig. 3, and Vittadini. It would seem that such elongated specimens have been sometimes referred to *C. formosa*, whence has arisen the idea amongst some recent writers that *C. formosa* has red-tipped branches.

Even when old, however, *C. botrytis* may always be recognised by its characteristic, striate spores, as was noted by us and pointed out by Maire (loc. cit.). Maire suggests that *C. Rielii* Boud. (Bull. Soc. Myc. Fr. xiii. 1897, p. 14) and *C. sculpta* Beck (Verh. k. zool.-bot. Ges. Wien, 39, 1889, p. 603) may have been old specimens of *C. botrytis* from which the branches had been for the most part broken off. The fact that the striations of the spore wall are not mentioned by these authors may merely be due to the fact that they did not examine the spores with a sufficiently high magnification.

4. C. FORMOSA *Fr.*, Syst. Myc. i. p. 466.

C. formosa Pers., Comm. p. 41; ? *C. fastigiata* Batsch, Elench. tab. 11, fig. 48; *C. coralloides purpurea* Holmsk., Fung. Dan. i. 1799, p. 116, tab. 30, p.p.; *Clavariella formosa* Karst., Hattsv. ii. 1882, p. 185.

Illustrations: Pers., Ic. et Descr. i. tab. 3, fig. 6; Gillet, Champ. Fr. Hymen. tab. 511; Holmsk., Fung. Dan. i. 1799, tab. 30 (*b* and *c*); Krombh., Abb. u. Beschreib. tab. 54, figs. 21–22; Rolland in Bull. Soc. Myc. Fr. ix. 1893, tab. 4, fig. 8; Weberbauer, Pilze, tab. 10, fig. 2.

Plants large, about 15 cm. in diameter, gregarious, much branched, very fragile, colour pinkish buff, pale at first but deeper later, the tips of the branches yellowish or very slightly tinged with pink, every part turning violet and finally black when bruised; taste slight, smell none. *Stem* white at first, then deep pinkish buff, rooting base absent. *Branching* irregular or irregularly dichotomous, axils slightly flattened; branches erect, cylindrical or flattened, elongated, distinctly grooved, 1 cm. thick below, 2 mm. above, apices blunt. *Flesh* white, solid. *Internal structure* of frequently septate irregular hyphae, loosely interwoven in the centre, 6–8 (–10)μ wide, occasionally swollen up to 14μ at the septa, more slender and more closely interwoven towards the margin, somewhat parenchymatous in transverse section. A few latex hyphae present. *Basidia* not conspicuous, 30–40 × 6–8μ; sterigmata 4, erect. *Spores* pale-coloured, ochraceous in the mass, elliptical, apiculate, minutely granular, almost smooth, 9–11 × 5μ.

Habitat. On the ground under trees (beech). Lyndhurst, Sept. 1916, growing in a large semicircle.

Very rare in Britain. The above description is drawn up from the Lyndhurst specimens, which on the whole appear to agree better with the older descriptions of *C. formosa* than some of the British plants which have been so referred.

As here understood, *C. formosa* is a large, very fragile plant, differing from *C. botrytis* in the fact that the apices of the branches are yellowish, or at most slightly tinged pinkish, and in the granular, not striate spores. It is distinguished from *C. flava* and *C. aurea* by the pinkish buff colour, which is somewhat like that of *C. stricta.* The original record of *C. formosa* in Britain, by Berkeley and Broome (Ann. Nat. Hist. ser. 3, vol. xv. 1865, p. 321), appears to have been based on a plant which was distinct from any of these species, and which is here described as a new species (*C. Broomei*), while some of the later records, such as the Haslemere specimens, have been old specimens of *C. botrytis*, as is pointed out in the notes on that species.

(*b*) Plants medium-sized, up to 5 cm. high; spores 6–10μ long.

5. C. STRICTA *Fr.*, Syst. Myc. i. p. 468.

C. stricta Pers., in Ust. Annal. xv. 1795, p. 33; Comment. p. 45; *Clavariella stricta* Karst., Hattsv. ii. 1882, p. 188; *Clavaria Kewensis* Mass., in Journ. Bot. 34, 1896, p. 470.

Illustrations: Pers., Comment. tab. 4, fig. 1; Berk., Outl. tab. 18, fig. 5; Bull., tab. 358, figs. A, B (*C. crispula* Fr.); Weberbauer, Pilze, tab. 10, fig. 3; Migula in Thomé, Flora von Deutschl. iii. 2, 1, tab. 23, fig. 2.

Plants branched, 3–5 cm. high, gregarious, tough, ochraceous, tinged with vinous (or pale pinky buff), apices pale yellow; smell strong, spicy, taste bitter. *Stem* distinct, thick, short, tough, with root-like strands of white mycelium at base. *Branching* irregularly dichotomous, axils acute; branches slender, cylindrical or sometimes compressed, erect, attenuated, apices somewhat pointed, slightly incurved, solid. *Flesh* concolorous. *Internal structure* of interwoven hyphae, 4–10μ in diameter, not parenchymatous in transverse section; central hyphae often rather thick-walled. *Basidia* distinct, 30–40 × 7–9μ, contents granular; sterigmata 4, erect. *Spores* ochraceous in the mass, almost hyaline by transmitted light, pip-shaped, almost smooth, 7–10 × 3–5μ (average 8–9 × 4μ), guttulate or granular.

Habitat. On rotten wood, stumps, etc., or on the ground in the vicinity of logs. Rather common.

Distinguished by its lignicolous habitat, the white cord-like mycelium, and the bitter taste. The branches are unusually parallel to each other and form a compact fascicle.

C. STRICTA var. ALBA, var. nov.

Apparently an albino form which resembles the type form in all respects, except that the colour is entirely creamy-white.

Habitat. On the ground amongst fallen leaves, twigs, etc. Drumnadrochit, N.B. (Angus Grant, 1908, 1912).

6. C. ABIETINA *Fr.*, Syst. Myc. i. p. 469.

C. abietina Pers., Comm. p. 46; *Clavariella abietina* Karst., Hattsv. ii. 1882, p. 185.

Illustrations: Cooke, Handb. p. 330, fig. 88; Flor. Dan. tab. 2030, fig. 2; Greville, Scott. Crypt. Flor. tab. 117; Massee, Brit. Fung. Flor. i. p. 74, figs. 2–3; Pat., Tab. Anal. fig. 566.

Plants much branched, forming spherical tufts, 3–5 cm. high, tough, deep dull ochraceous in colour, becoming greenish when bruised; smell strong, taste bitter. *Stem* short, thick, whitish, downy, with a slightly rooting base, becoming greenish. *Branches* slender, 1–2 mm. thick, erect, repeatedly forked, cylindrical or compressed, longitudinally wrinkled when dry, apices pointed or bifid, axils acute. *Flesh* white. *Internal structure* filamentous, hyphae loosely interwoven, 4–10μ (average 5–7μ), slightly septate. *Basidia* small, 35–40 × 7–8μ, contents uniform, finely granular, sterigmata 4, erect. *Spores* deep ochraceous in the mass, copious, finely rough, pip-shaped, 7–10 × 3–5μ (average 7–8 × 3–5μ).

Habitat. On the ground in fir woods. Fairly common.

Easily distinguished from all other British species by becoming green when bruised. It is allied to *C. flaccida* and *C. Invalii*, and occurs in similar localities. The spores are larger than those of *C. flaccida*, and more like those of *C. Invalii.*

7. C. FLACCIDA *Fr.*, Syst. Myc. i. p. 471.

Clavariella flaccida Karst., Hattsv. ii. 1882, p. 186.

Illustrations: Fries, Icon. Hymen. tab. 199, fig. 4; Karsten, Finl. Basidsv. tab. 9, *fig.* 139; Pat., Tab. Anal. fig. 39.

Plants branched, small, 3–4 cm. high, gregarious, rather tough, but flaccid, bright ochraceous in colour, tips paler, base whitish, does not turn green on bruising; smell and taste slight, pleasant. *Main stem* very short, white, with white, floccose mycelium. *Branches* very crowded, repeatedly forked, erect, upper axils rounded, the pointed terminal branches usually curving inwards towards each other, solid. *Flesh* white. *Internal structure* composed of loosely interwoven, slightly septate filaments, 7–10μ in diameter, not parenchymatous in transverse section and more densely arranged towards the periphery. *Basidia* small, conspicuous, 30 × 7–9μ, contents finely granular; sterigmata 4. *Spores* not copious, ochraceous, very finely punctate, pip-shaped, 6–8 × 3–5μ (av. 6–7 × 3μ), sometimes with a hyaline basal tip.

Habitat. Amongst moss and leaves in coniferous woods. Not common.

Specimens from Alresford, Hants. (C. Rea, 1904, and W. L. W. Eyre, 1911); Midhurst (E. M. W., 1913); Lyndhurst (A. D. C., 1916). Recorded at the Rothiemurchus (1900), Exeter (1901), and Savernake Forest (1903) forays.

Somewhat resembling *C. abietina*, but the whole fungus is more flaccid, and does not turn green when bruised. Stem sometimes up to 1·75 cm. long, at others almost obsolete. Mycelium whitish, creeping over leaves, etc.

8. C. INVALII *Cotton et Wakefield*, sp. nov.

Fungus dense ramosus, 4–5 cm. altus, rigidus, ochraceus. *Stipes* brevis, albido-tomentosus, basi radiculis mycelialibus albis vel flavidis instructus. *Rami* tenues, breves, cylindrici, erecti, laeves, apiçibus acutis, intus solidi, albido. *Hyphae* irregulares 5–10μ diametro, laxe intertextae. *Basidia* 30–40 × 7–9μ, intus granulosa; sterigmata 4, erecta. *Sporae* copiosae, ochraceae, obovatae, basi leviter incurvatae, echinulatae, 7–9 × 4μ.

Habitat. On the ground amongst leaves in thick plantations of spruce, larch, etc. Inval, Haslemere, E. W. Swanton, 1905–1908.

Plants solitary or gregarious, branched, forming dense compact, almost spherical tufts, 4–5 cm. high, tough, rather rigid, deep ochre in colour; smell slightly pungent, taste faint, hardly bitter. *Stem* more or less distinct, short, often woolly, with white or yellowish rooting strands. *Branching* irregular, frequent, axils acute; branches slender, short, uneven, cylindrical, erect, smooth, solid, apices attenuated and pointed. *Flesh* white. *Internal structure* of irregular, wavy filamentous hyphae, 5–10μ in diameter, loosely interwoven and running equally in each direction. *Basidia* conspicuous, 30–40 × 7–9μ, contents finely granular; sterigmata 4, erect. *Spores* abundant, yellow, pip-shaped, slightly incurved at the base, echinulate, 7–9 × 4μ (average 8 × 4μ).

This species, which is obviously very rare in Britain, has been sent to us repeatedly from the spruce plantations at Inval, near Haslemere, by Mr. E. W. Swanton. It is perfectly distinct from all other species we have received and being unable to place it with certainty in any Continental species we have been compelled to describe it as new. The plant is closely allied to *C. abietina* and *C. flaccida*. From the former it differs in not turning green when bruised and retaining its deep bright colour when dried, and from the latter in its stouter form, more rigid habit, and larger and more deeply coloured spores.

2. *Plants variously coloured, spores hyaline.*

(*a*) Plants white.

9. C. CRISTATA *Fr.*, Syst. Myc. i. p. 473.

C. cristata Pers., Syn. p. 591; *Ramaria cristata* Holmsk., Beata ruris, 1790, p. 92; *Ramaria ornithopodioides* Holmsk., ibid. p. 26; *Clavaria fallax* Pers., Comment. p. 48; *C. fallax* var. *cristata* Pers., ibid.; *C. trichopus* Pers., Comment. p. 50; *C. albida* Schaeff., Icon. Fung. tab. 170; *Clavulina cristata* Schroet., Pilz. Schles. i. p. 442.

Illustrations: Pers., Comment. tab. 2, fig. 4, and tab. 4, fig. 3; Berk. in Ann. Nat. Hist. i. 1838, tab. 5, fig. 46 (hymen.); Fries, Sver. Atl. Svamp. tab. 92, figs. 1–5; Greville, Scott. Crypt. Flor. tab. 190; Holmsk., Fung. Dan. i. 1799, tabs. 20, 23; Pat., Tab. Anal. figs. 37, 261; Quélet, loc. cit.; Weberbauer, Pilze, tab. 10, fig. 4.

Plants branched, 3–8 cm. high, gregarious, fragile, pure white, pinkish white, or with a tinge of mouse-grey; smell none, taste distinct. *Stem* short, slender or stout. *Branches* numerous, irregular, flattened upwards, and divided at the tips into sharp-pointed branchlets; axils rounded. *Flesh* white. *Internal structure* composed of loosely interwoven, more or less parallel filaments, fairly regular, frequently septate, segments 35–40 × 5–6μ, in the centre 50–70 × 6–9μ. *Basidia* small, 25 × 6–7μ, contents densely granular; sterigmata 2. *Spores* smooth, hyaline, subglobose, apiculate, 9–12 × 6–8μ (av. 9 × 7μ or 7–8μ diam.), with a large conspicuous oil-globule.

Habitat. On the ground in woods, etc. Very common.

We have retained this species in the sense in which it is usually understood, but not without some misgivings. It is obviously nearly allied to *C. cinerea*, and small crested forms of the latter are difficult to distinguish from certain forms of *C. cristata*. It is noteworthy also that *C. cristata* usually occurs in more shaded spots, and frequently covered with leaves or screened by logs of wood.

The black parasitic mould *Scoletotrichum Clavariarum* occurs perhaps more frequently on this species than on any other.

10. C. KUNZEI *Fr.*, Syst. Myc. i. p. 474; Cotton in Trans. Brit. Myc. Soc. iii. 1909, p. 180.

C. chionea Pers., Myc. Eur. i. 1822, p. 167; *Clavulina Kunzei* Schroet., Pilz. Schles. i. p. 442; *Clavaria Krombholzii* Fr., Epicr. 1836–38, p. 572.

Illustrations: Quélet, Ch. Vosges, 3, tab. 2, fig. 11; Weberbauer, Pilze, tab. 10, fig. 5.

Plants medium-sized, 5–12 cm. high, branched, isolated or gregarious, brittle, ivory to creamy white, base sometimes pink; smell none, taste pleasant. *Stem* usually distinct, 1–2 cm. long, 3–5 mm. thick, but sometimes absent. *Branching* irregularly dichotomous, or irregular, loose or rarely compact; branches erect or spreading, cylindrical or slightly compressed, often elongated, 2–5 mm. thick, even, solid, axils lunate, apices blunt or pointed. *Internal structure* pseudoparenchymatous in transverse section, cells long, 100–300 × 5–8μ. *Basidia* small, 30–35 × 5–6μ; sterigmata 4. *Spores* smooth, hyaline, globose, minutely apiculate, very small, 3·5–4·5μ in diameter, one-guttulate.

Habitat. In long grass in woods and pastures. Uncommon, but in certain seasons frequent.

This species is very distinct in its beautiful ivory-white colour and loosely branched habit. When well grown it may form tufts 4 to 5 inches high and as much across, but average plants are decidedly smaller. From *C. rugosa* it is distinguished by being branched from the base and by the slender, even (not rugose) branches, and from *C. cristata* by the loose habit, lunate axils, and non-cristate apices. From both it differs in the very small spores.

The type specimens of *C. chionea* are in the Persoon herbarium at Leyden, and Dr. Goethart reported that they agreed in form and size with British specimens of *C. Kunzei* which were submitted to him.

With regard to *C. Krombholzii,* this species was based by Fries on Krombholz, tab. 53, figs. 15, 16, and tab. 54, figs. 18–20, which the latter had referred to *C. Kunzei.* It differed principally in being less branched and in the branches being somewhat flattened. *C. Kunzei* however is well known to be a very variable plant, and it sometimes assumes forms which correspond with the description given for *C. Krombholzii.* No plants have been seen under the latter name which were specifically distinct from *C. Kunzei* or *C. rugosa.*

(*b*) Plants greyish.

11. C. CINEREA *Fr.*, Syst. Myc. i. p. 468; see also Cotton in Trans. Brit. Myc. Soc. iii. 1909, p. 184.

C. cinerea Bull., Ch. Fr. p. 204, tab. 354; *C. grisea* Pers., Comment. p. 44; *C. fuliginea* Pers., Myc. Eur. i. 1822, p. 166; *Clavulina cinerea* Schroet., Pilz. Schles. i. p. 443.

Illustrations: Bulliard, loc. cit.; Badham, Esc. Fung. tab. 15, fig. 5; Bolton, Hist. Fung. tab. 113 (*C. coralloides,* poor); Cooke, Plain and Easy Acc. Brit. Fung. Ed. i, 1862, tab. 17, fig. 1; Ed. iii, 1876, tab. 10, fig. 2; Greville, Scott. Crypt. Flor. tabs. 64, 321 (vars.); Pat., Tab. Anal. fig. 154; Stevenson, Hymen. ii. p. 290; Weberbauer, Pilze, tab. 11, fig. 2 (*C. grisea*).

Plants branched, very variable in habit, usually 3–5 cm. in height, but sometimes more, solitary or gregarious, greyish or with a faint tinge of purple, rather brittle; smell none, taste mild. *Stem* more or less distinct, thick, short. *Branching* irregular, repeated, uneven, axils usually acute; branches thick or slender, cylindrical or compressed, short, stuffed, erect, wrinkled, apices often toothed. *Flesh* white. *Internal* *structure* composed of hyphae 8–10 (–12)μ in diameter, with occasional inflations, slightly septate, loosely filamentous, irregular in transverse section. *Basidia* long, conspicuous, 35–50 (–70) × 6–10μ, contents finely granular; sterigmata 2. *Spores* copious, smooth, hyaline, subglobose or obovate, apiculate at the base, 7–10 × 6–8μ, with one large oil-globule.

Habitat. On the ground in woods, etc. Common and edible.

Very variable in form but known by its grey colour and large spores, the former however being variable in tint. See also the notes under *C. cristata.*

C. CINEREA var. GRACILIS *Rea*, in Trans. Brit. Myc. Soc. vi. 1917, p. 62.

Distinguished from the type form by its larger size, longer and more slender stem, with numerous slender branches and branchlets. Spores 9 × 8μ, with a large central gutta.

Habitat. On bare soil in woods. Caughley, Salop, and Shrawley, Worcestershire.

12. C. GIGASPORA *Cotton*, in Naturalist, 1907, pp. 97–98.

Illustrations: None published.

Plants branched, caespitose but distinct at the base, or solitary, small, up to 3 cm. high, tough, greyish with a tinge of yellow, whitish at base of stem, smell and taste absent. *Stem* slender, not very distinct, 1 cm. long or shorter. *Branching* irregular, sometimes almost palmate, branches erect, occasionally forked, often wrinkled, solid, terete or compressed, much compressed at the acute axils, ultimate branches attenuated, apices blunt. *Internal structure* of densely packed hyphae 4–4·5μ in diameter, forming a firm tough tissue, rather horny when dry. *Basidia* large, 60–70 × 15μ, contents finely granular; sterigmata 4, rather stout, 8–10μ long. *Spores* smooth, hyaline, somewhat pip-shaped, very variable in size, 10–20 × 7–9μ (average 12–16 × 7·5–8μ), contents guttulate, then granular.

Habitat. Amongst moss on a rocky, heathy slope. Only known from the type locality, near Cullingworth, Yorks.

A small, dingy, yellowish-white plant, scarcely overtopping the moss in which it grows. It resembles certain forms of *C. cinerea* and *C. cristata*, but is readily distinguished from either by the exceedingly large spores. The structure also is somewhat exceptional, being composed of very fine, densely matted hyphae, which give rise to unusually large basidia.

(*c*) Plants violet.

13. C. AMETHYSTINA *Fr.*, Syst. Myc. i. p. 472.

Clavaria amethystina Pers., Comment. p. 46; *Coralloides amethystina* Batt., Fung. Agr. Arim. Hist. 1759, p. 22, tab. 1, fig. C; *Ramaria amethystina* Holmsk., Beata ruris, 1790, p. 110; *Clavaria amethystea* Bull., Champ. Fr. tab. 496, fig. 2.

Illustrations: Bulliard, loc. cit.; Badham, Esc. Fung. tab. 5, fig. 2; Berk., Outl. tab. 18, fig. 2; Cooke, Plain and Easy Acc. Brit. Fungi, Ed. i, tab. 17, fig. 2; Ed. iii, tab. 11, fig. 3; Cooke, Brit. Edible Fungi, tab. 1, fig. 4; Holmsk., Fung. Dan. i. tab. 28.

Plants branched, 3–4 cm. high, forming small, very compact tufts, lilac or mauve, turning rapidly to yellowish on drying, rather brittle; smell strong, taste tallowy. *Stem* very short, scarcely distinct. *Branching* irregular, axils not flattened; branches thick, 3–5 mm. in diameter, short, cylindrical, not attenuated, erect, smooth, solid, apices blunt. *Flesh* uniform. *Internal structure* of densely interwoven hyphae, frequently septate, cells 50–100 × 8–12μ, not pseudoparenchymatous in transverse section. *Basidia* rather large, 50–60 × 7–10μ, sterigmata 2–4. *Spores* smooth, hyaline, globose, with minute basal apiculus, 5–7μ in diameter.

Habitat. Among grass in woods and pastures. Rare.

Specimens from Rothiemurchus (1900); Alresford, Hants. (W. L. W. Eyre, 1905, 1909); Clare Island (H. C. Hawley, 1910); Dolgelley (C. Th. Green, 1910).

C. amethystina has somewhat the habit of a short thick form of *C. cinerea*, with the deep-coloured forms of which it has by some authors been confused. When once the true plant has been seen, however, there is no difficulty in distinguishing it by its beautiful violet colour (almost as deep as that of *Laccaria laccata* var. *amethystina*), and by its much smaller spores. It is usually much branched, but sometimes almost simple. The only other violet species in Britain, *C. Bizzozeriana*, is very much more slender, and in no way related.

14. C. BIZZOZERIANA *Sacc.*, Syll. vi. 1888, p. 693.

C. tenuissima Sacc., Michelia, i. 1878, p. 436 (*non* Lév.); *C. conchyliata* Allen, in Trans. Brit. Myc. Soc. iii. 1908, p. 92.

Illustrations: Trans. Brit. Myc. Soc. iii. 1908, tab. 8.

Plants branched, very small, not more than 1 cm. in height, solitary or in groups, at first violet, becoming discoloured with age. *Stem* reddish-yellow, pubescent below, with rooting base. *Branching* irregular, dichotomous, the axils of the branches patent; branches very slender, 0·5 mm. thick, erect, apices blunt. *Flesh* white. *Internal structure* filamentous, filaments 3–4μ in diameter. *Basidia* 15–18 × 3–4μ; sterigmata 2–4. *Spores* hyaline, smooth, globose or subglobose, 2·4–3·5μ in diameter, 1-guttulate.

Habitat. On the ground, under hazel. Rare.

Easily recognised by the very small size and the violet colour of the branches, which are "irregular and divaricate with somewhat digitate ends."

It is regrettable that the name *C. conchyliata* must be dropped in favour of *C. Bizzozeriana.* Mr. Allen submitted specimens of his plant to Kew in 1907, and was informed that it was apparently an undescribed species. Specimens of the same species were received from Switzerland in 1912 and it was subsequently discovered that the plant was *C. Bizzozeriana,* a species described by Saccardo in 1888.

The species is very rare in Britain, but material has been forwarded on two occasions by Dr. J. S. Bayliss Elliott.

(*d*) Plants clear yellow.

15. C. CORNICULATA *Fr.*, Syst. Myc. i. p. 471.

C. corniculata Schaeff., Icon. Fung. tab. 173; *C. muscoides* Linn., Spec. Plant. 1753, p. 1183; *Ramaria muscoides* Holmsk., Beata ruris, 1790, p. 87; *Clavaria furcata* Pers., Comment. p. 52.

Illustrations: Bolton, Hist. Fung. tab. 114 (poor); Fl. Dan. tab. 775, fig. 3; Holmsk., Fung. Dan. i. tab. 21; Pat., Tab. Anal. fig. 564; Schaeff., tab. cit.

Plant branched, 3–4 cm. high, gregarious, tough, clear egg-yellow; smell none, taste mild. *Stem* short, downy at the base. *Branches* slender, two or three times forked, erect, even, solid, axils lunate or acute, often compressed, apices attenuated, not pointed. *Flesh* slightly paler than the exterior. *Internal structure* composed of filaments running parallel to the axis, not interwoven but very easily separating and becoming twisted, 4–8μ thick (average 5–7μ), fairly frequently septate with cells 100–200μ long, not pseudoparenchymatous in transverse section. *Basidia* distinct, about 50μ long, vacuolate or clear; sterigmata 4, 10μ long, fairly erect. *Spores* white in the mass, smooth, subglobose, apiculate, hyaline, 6–7μ in diameter, guttulate.

Habitat. Amongst grass, especially in fields. Common.

This is the commonest of the branched yellow species. It varies in form in accordance with its surroundings, but the clear yellow colour and beautiful globose spores, 6–7μ in diameter, clearly separate it from other species. The height of the plant is determined by the nature of the surrounding vegetation and conditions of exposure. In long damp grass it grows loosely and is frequently four inches in height, whereas in shorter grass and more open surroundings it is shorter and more compact; whilst on exposed hills and downs the dwarf form, var. *pratensis*, is produced. The latter is a very common plant, and may occasionally be found in vast quantities.

C. corniculata was formerly known in all British works as *C. muscoides*. The change in name is necessitated by the International Rules of Nomenclature. It was agreed that the starting-point for the nomenclature of the Hymenomycetes should be Fries' Systema Mycologicum, 1821–1832, and as Fries there adopts the names *C. corniculata* and *C. pratensis* these stand, in spite of the fact that he later changed his mind and adopted the Linnaean names *C. muscoides* and *C. fastigiata*.

C. CORNICULATA *Fr.* var. PRATENSIS *Cotton et Wakef.*

Clavaria pratensis Fr., Syst. Myc. i. p. 471; Pers., Comment. p. 51; *C. fastigiata* Linn., Spec. Plant., 1753, p. 118; *Ramaria fastigiata* Holmsk., Beata ruris, 1790, p. 90; *Clavaria muscoides* var. *fastigiata* Cotton, in Trans. Brit. Myc. Soc. iii. 1909, p. 181.

Illustrations: Bolton, Hist. Fung. tab. 112, fig. 2 (poor); Bull., Champ. Fr. tab. 358, figs. D, E; Holmsk., Fung. Dan. i. tab. 22; Flor. Dan. tab. 836, fig. 2; Pers., Comment. tab. 4, fig. 5.

Plants tough, very much branched, branches crowded, of equal length and forming a level top. Colour the same as that of the typical form.

Habitat. In short grass in exposed situations.

This plant was formerly known as *C. muscoides* var. *fastigiata* (= *C. fastigiata* L.). For remarks as to habitat, etc., see notes under typical form.

(*e*) Plants pale umber.

16. C. UMBRINELLA *Sacc.*, Syll. vi. 1888, p. 695; Cotton in Trans. Brit. Myc. Soc. iii. 1909, p. 181.

C. umbrina Berk., Outlines, 1860, p. 279.

Illustrations: Berk., loc. cit. tab. 18, fig. 4 (very poor); Cotton, loc. cit. tab. 11, fig. E (spores).

Plants slightly branched, small, 2–2·5 cm. high, isolated or caespitose, pale brown; smell none, taste pleasant. *Stem* sometimes thick and minutely velvety, but often absent, a number of slender branches arising close together from the base. *Branching* irregularly dichotomous, axils somewhat flattened; branches slender, erect, cylindrical, 1–2 mm. thick, even, solid. *Internal structure* composed of loosely and slightly interwoven filaments, 5–10μ in diameter (average 7–8μ). *Basidia* small, 35–40 × 6–7μ, contents finely granular; sterigmata 4. *Spores* hyaline, smooth, pip-shaped, laterally apiculate, 4–5 × 4μ or 5–6 × 3–4μ, usually guttulate.

Habitat. On lawns. Uncommon.

C. umbrinella is a well-marked and somewhat uncommon species. It is distinguished by its short branched habit, like that of *C. corniculata* var. *pratensis*, and by its pale brown colour.

Owing partly to the poorness of Berkeley's figure a good deal of uncertainty has existed as to its identity. Part of the original gathering which exists at Kew, however, shows the characteristic pip-shaped spores. The specimens taken together with Berkeley's description and his rider that "The habit is that of *C. fastigiata*" leave no doubt as to the plant he had in view.

B. PLANTS SIMPLE.

1. *Plants tufted.*

17. C. VERMICULARIS *Fr.*, Syst. Myc. i. p. 484; Cotton in Trans. Brit. Myc. Soc. iii. 1907, p. 32.

C. fragilis Holmsk. p.p., Beata ruris, 1790, p. 7; *C. vermiculata* Scop., Flor. Carniol. ii. 1772, p. 483.

Illustrations: Cooke, Plain and Easy Acc. Brit. Fungi, Ed. i, 1862, tab. 17, fig. 4; Ed. iii, 1876, tab. 6, fig. 3; Cooke, Brit. Edible Fungi, tab. 4, fig. 15; Holmsk., Fung. Dan. i. tab. 2, fig. *f*; Stevenson, Hymenomyc. ii. p. 298.

Plants unbranched, densely tufted, somewhat flexuous, brittle, white, about 4–6 cm. high. *Clubs* cylindrical, sometimes twisted and compressed, apex acute, smooth, fragile, becoming hollow. *Stem* not distinct. *Internal structure* of parallel, septate hyphae, with rather long cells, pseudoparenchymatous in transverse section, central cells 10–15μ in diameter, with smaller cells intermixed. *Basidia* small, 30 × 6–7μ; sterigmata 4. *Spores* smooth, hyaline, subglobose, minutely apiculate at the base, 3–5 × 3–4μ.

Habitat. In meadows, etc. Common, especially early in the autumn.

Easily distinguished among the white species by the densely tufted habit, very fragile clubs and small spores.

18. C. FUMOSA *Fr.*, Syst. Myc. i. p. 483.

C. fumosa Pers., Obs. Myc. i. p. 31; Comment. p. 76.

Illustrations: Krombholz, Abb. und Beschreib. tab. 53, fig. 18.

Plants unbranched, tufted, very brittle, 4–8 cm. high; smell none; taste marked, pleasant. *Clubs* white when young, later pale mouse-grey, tips brown, base whitish, cylindrical or clavate, sometimes furrowed, surface smooth or slightly furrowed, becoming hollow with age, apex blunt or acute. *Stem* not at all or scarcely distinct from club. *Flesh* white, the hymenial layer easily peeling off. *Internal structure* of short cylindrical cells, 30–50 × 10–15μ, parallel to the long axis of the club; structure in transverse section pseudoparenchymatous, like that of *C. vermicularis*. *Basidia* inconspicuous, 35 × 6–7μ; sterigmata 2–4, short. *Spores* smooth, hyaline, cylindric-ellipsoid or somewhat pip-shaped with minute oblique apiculus, 6–8 × 3–4μ, contents often guttulate or granular.

Habitat. Amongst grass in fields. Not common.

This species has the dense tufted habit of *C. vermicularis* and occurs in similar situations, but is grey in colour. If there is any doubt the much larger spores at once distinguish it.

19. C. FUSIFORMIS *Fr.*, Syst. Myc. i. p. 480.

C. fusiformis Sow., Col. Fig. tab. 234; *C. fasciculata* Pers. Comment. p. 72; *C. ceranoides* Pers., Syn. p. 594.

Illustrations: Bolton, Hist. Fung. tab. 110 (as *C. pistillaris*); Cotton in Trans. Brit. Myc. Soc. iii. 1909, tab. 11, fig. A; Hussey, Illustr. Brit. Mycol. i. tab. 18; Pat., Tab. Anal. fig. 565; Sowerby, loc. cit. tabs. 234, 235 (the latter figure the basis of *C. ceranoides* Pers.).

Plants simple or very rarely branched, densely tufted, connate at the base, 5–8 cm. high, clear canary-yellow; smell none when fresh, taste bitter. *Clubs* elongated, spindle-shaped, tips acute, often becoming hollow and compressed. *Stem* not distinct. *Flesh* whitish, as in *C. inaequalis*. *Internal structure* of fine filaments, 4–6μ thick, more or less interwoven, walls sometimes rough; occasional hyphae with dark yellow contents. Mature *basidia* hyaline, 35–40 × 6·8μ; sterigmata 4, slightly curved. *Spores* globose, smooth, minutely apiculate, 5–7 (–8)μ in diameter, at first yellow, then colourless.

Habitat. Amongst grass in the open and in woods. Common.

Known amongst the simple yellow species by the densely tufted habit, the canary-yellow colour and the bitter taste.

2. *Plants solitary or in small groups.*

(*a*) Plants white.

20. C. ACUTA *Fr.*, Syst. Myc. i. p. 485; Cotton in Trans. Brit. Myc. Soc. iii. 1907, p. 31.

C. acuta Sow., Col. Fig. tab. 333; ? *C. falcata* Pers., Comment. p. 81, tab. 1, fig. 3.

Illustrations: Sowerby, loc. cit.

Plants unbranched, solitary or in small groups, 3–7 cm. high, glistening white; smell none, taste distinct, pleasant. *Clubs* slender, about 2–3 mm. wide, cylindrical or compressed, smooth, becoming hollow, very brittle, apex acute or obtuse. *Stem* more or less distinct from the club, variable in length, 1–2 cm., white. *Internal structure* of frequently septate hyphae, running parallel to the long axis of the club, 5–12 (–30) μ in diameter, average 10 μ, pseudoparenchymatous in transverse section. *Basidia* conspicuous, small, 30–35 × 7–8 μ, contents granular; sterigmata 2–4, slightly divergent. *Spores* subglobose, smooth, hyaline, minutely apiculate, 7–10 × 6–9 μ (average 8–9 × 7–8 μ), contents granular, guttulate when young.

Habitat. Amongst grass in woods, on shady lawns, etc., and often on the soil of plant pots in greenhouses. Not common.

Clavaria acuta has probably often been referred to *C. fragilis*, which is however in part a synonym of *C. vermicularis*. This species is distinguished from *C. vermicularis* by its solitary habit of growth, distinct stem, and large spores. Its frequent occurrence in greenhouses has been noted by several writers.

21. C. RUGOSA *Fr.*, Syst. Myc. i. p. 473.

C. rugosa Bull., Ch. Fr. p. 206, tab. 448, fig. 2; *C. damicornis* Schrank, Baiersche Flor. ii. 1789, p. 666; *C. elegans* Bolt., Hist. Fung. tab. 115; *C. laciniata* Schaeff., Icon. Fung. tab. 291; *C. canaliculata* Fr., Obs. Myc. ii. p. 294; *Clavulina rugosa* Schroet., Pilz. Schles. i. p. 442.

Illustrations: Bulliard, loc. cit.; Badham, Esc. Fung. tab. 15, fig. 4; Berk., Outlines, tab. 18, fig. 3; Bolton, loc. cit.; Cooke, Plain and Easy Acc. Brit. Fung. Ed. i, tab. 17, fig. 3; Ed. iii, tab. 6, fig. 2; Cooke, Brit. Edible Fung. tab. 9, fig. 32; Greville, Scott. Crypt. Flor. tab. 328; Pers., loc. cit.; Sowerby, Col. Fig. tab. 278, lower figs. (as *C. coralloides*).

Plants simple or slightly irregularly branched, solitary or gregarious, 5–10 cm. high, white or pallid, rather tough. *Clubs* thickened upwards, up to 1 cm. thick, longitudinally wrinkled, solid, apex blunt. *Stem* not distinct. *Internal structure* uniform, somewhat dense, but looser in centre, of much interwoven, frequently septate hyphae, 8–10μ in diameter. *Basidia* long, conspicuous, up to 60μ long, 5–6μ wide, contents granular; sterigmata 2. *Spores* subglobose, smooth, hyaline, with basal apiculus, and a large guttule, 9–11 × 8–9μ (or 9–10μ in diameter).

Habitat. In woods and shady spots. Common.

This species varies in habit from simple to very branched forms, and the surface may be exceedingly rugose to almost smooth. It is generally recognisable, however, by the distinct, irregular, longitudinal wrinkles, and the large spores.

C. RUGOSA var. FULIGINEA *Fr.*, Hym. Eur. p. 669; Rea in Trans. Brit. Myc. Soc. vi. 1917, p. 62.

This variety is unknown to us, it is said to differ from the type in the dark, sooty colour of the clubs and flesh. It has been collected recently in England by Mr. Carleton Rea.

Habitat. On the ground, Caughley Wood, Salop, 1917.

22. C. ASTEROSPORA *Pat.*, Tab. Anal. ser. 2, 1886, p. 28, fig. 568.

Illustration: Pat., loc. cit.

Plants simple, slender, gregarious, 2–3 cm. high, pure white. *Clubs* cylindrical, fragile, smooth, hollow, apex blunt or pointed. *Stem* slender, greenish at the base, not markedly distinct from the club. *Internal structure* pseudoparenchymatous in transverse section. *Basidia* clavate, 30–40 × 8μ; sterigmata 4. *Spores* hyaline, globose, with long, scattered spines, spore-body 7–8μ in diameter.

Habitat. On bare soil, rare. Specimens from Haslemere (A. D. C., 1905; E. M. W., 1913).

This species is distinguished from other white simple forms by the globose, distinctly spiny spores. *C. tenerrima* Mass. et Crossl. is similar in habit, but the spores are described as granular. The latter has not been met with since it was described, and is therefore listed here among the doubtful species.

(*b*) Plants drab or greyish.

23. C. TENUIPES *Berk. et Br.*, in Ann. Nat. Hist. ser. 2, ii. 1848, p. 266, No. 369; Cotton in Trans. Brit. Myc. Soc. iii. 1909, p. 182.

Pistillaria tenuipes Mass., Brit. Fung. Flor. i. p. 91.

Illustrations: Berk. et Br., loc. cit. tab. 9, fig. 2; Cooke, Handbook Brit. Fung. i. p. 336; Mass., Brit. Fung. Flor. i. p. 74, figs. 6, 7.

Plants simple, isolated or in small groups, small, pale grey to drab in colour; smell none; taste "mushroom-like." *Clubs* 3–6 cm. high, 2–10 mm. wide, clavate or cylindrical, often compressed, smooth or slightly rugulose, hollow when old, apex blunt. *Stem* more or less distinct, slender, 1–2 cm. long, 2–3 mm. wide. *Flesh* uniform in colour. *Internal structure* of loosely packed, unbranched hyphae, 8–10μ (rarely 15–20μ) in diameter, cells 50–150μ long. *Basidia* rather small, 30–40 × 7–9μ, contents granular; sterigmata 4, erect. *Spores* smooth, hyaline, ovoid, with a minute oblique basal apiculus, 7–9 × 4–5μ (average 8 × 4μ), contents guttulate, then granular.

Habitat. Amongst short grass, especially in heathy places.

The plant is readily recognised by its greyish or drab colour, and by the more or less thickened, fleshy club and slender stem. The name has been formerly often wrongly applied to *C. acuta*, which differs in its slender, very fragile, snow-white sporophores. The stem in some specimens is sharply separated from the spore-bearing surface; in others the transition is not so abrupt. On account of the somewhat tough texture and distinct stem the plant has been placed in Pistillaria, a genus of minute, epiphytic plants. It is however a genuine Clavaria.

24. C. CROSSLANDII *Cotton*, in Naturalist, 1912, p. 86.

Illustrations: None published.

Plants small, unbranched, isolated or fasciculate, greyish-white or grey, becoming darker with age; smell and taste slight, pleasant. *Clubs* very slender, brittle, 2–3 cm. high, 1–3 mm. thick, pruinose, cylindrical, apex usually pointed. *Stem* hardly distinct. *Flesh* somewhat darker than the hymenium. *Internal structure* pseudoparenchymatous in transverse section, cells 5–8μ in diameter. *Basidia* 20–25 × 4–5μ, contents granular; sterigmata 4, erect. *Spores* hyaline, smooth, pip-shaped, 4–5 × 2·5–3μ.

Habitat. In short grass. Known only from the type locality, Mulgrave Woods, Yorks. (C. Crossland and W. N. Cheesman, 1910–1911).

The grey colour and small size are good field characters by which to recognise the present species. From the drab-coloured *C. tenuipes* it is distinguished by its slender, brittle clubs, and from *C. fumosa* by its fasciculate instead of densely tufted habit. *C. acuta*, which is similar in size, habit, and texture, differs in the complete absence of the grey tinge. Furthermore the small basidia and spores mark off *C. Crosslandii* from allied species. It approaches *C. affinis* Pat. et

Doass., but the latter differs, according to the published description (no type is preserved), (i) in the distinct stem; (ii) in becoming yellow on drying; (iii) in the slightly larger, punctulate spores.

(c) Plants reddish or purple.

25. C. ROSEA *Fr.*, Syst. Myc. i. p. 482.

C. rosea Dalman, in Vet. Acad. Handl. 1811, p. 157.

Illustrations: Fries, Obs. Myc. ii. tab. 5, fig. 2; Krombh., Abbild. u. Beschreib. tab. 53, fig. 21.

Plants simple, solitary or in groups of 3–7, 2–4 cm. high, fragile, bright rose-pink; taste and smell none. *Clubs* slender, cylindrical or compressed, equal or tapering upwards, smooth, solid, 2–5 mm. thick, apex blunt or pointed. *Stem* fairly distinct, paler, sometimes yellowish. *Flesh* whitish, deep rose beneath the hymenium. *Internal structure* of frequently septate, irregular hyphae, 7–12 μ in diameter, semi-parenchymatous in transverse section; crystals sometimes present. *Basidia* conspicuous, 35–40 × 7–10 μ, granular or guttulate, sterigmata 4, erect. *Spores* copious, smooth, hyaline, ovoid or broadly elliptical, 7–10 × 5–6 μ.

Habitat. Amongst grass, moss, etc. Rare. Specimens from near Hebden Bridge (C. Crossland, 1895–97); Morpeth (C. H. Spencer Perceval, 1908, 1909, 1910); Halifax (C. Crossland, 1908); Forres (1912); Selby (1918).

Easily distinguished from other British species by the bright, rose-pink colour.

26. C. PURPUREA *Fr.*, Syst. Myc. i. p. 480.

C. purpurea Müller, in Flor. Dan. tab. 837, fig. 2.

Illustrations: Flor. Dan. tab. cit.

Plants unbranched, caespitose, up to 12 cm. high, somewhat tough, purplish brown or dark chocolate; smell none. *Clubs* slender, 1–2 mm. thick, flattened, smooth, solid, apex acute, paler. *Stem* hardly distinct, whitish at the base. *Flesh* not distinct. *Internal structure* of irregular hyphae, cells 50–60 μ long, 3–5 μ in diameter, or 7–9 μ towards the centre of the club, pseudoparenchymatous in transverse section. *Basidia* small 25–30 × 7–8 μ, guttulate; sterigmata 4, erect. *Spores* hyaline, smooth, oval, 7–8 × 4–5 μ, contents granular.

Habitat. Amongst grass. Very rare. Small specimen from Mulgrave Woods, Yorkshire (C. Crossland, 1910).

Distinguished by its dark, purplish-brown colour.

27. C. INCARNATA *Weinm.*, Hymeno- et Gasteromycetes, 1836, p. 510.

Illustrations: None published.

Plants simple, solitary or gregarious, fragile, 2–3·5 cm. high, flesh-coloured to pale chocolate; smell slight, pleasant. *Clubs* slender, 2–2·5 mm. thick, cylindrical or compressed, even or slightly rugose, hollow, apex blunt. *Stem* more or less distinct. *Flesh* coloured, pale or darker than the club. *Internal structure* of frequently septate hyphae, loosely interwoven, with trumpet-shaped expansions in the sub-hymenial layer, cells 50–100 × 5–10μ, pseudoparenchymatous in transverse section. *Basidia* 35–40 × 7–8 (–10)μ, contents finely granular; sterigmata 4, erect. *Spores* abundant, hyaline, smooth, ovoid, 7–10 × 6–8μ (average 8 × 5μ), contents granular.

Habitat. On the ground. Very rare. Specimens from Whitby and Halifax (C. Crossland, 1908); ? Haslemere (E. M. W., 1913).

Distinguished from *C. purpurea* by the paler colour, smaller size, and slightly larger spores. *C. rosea* differs in its brighter, rose-pink colour.

(*d*) Plants yellow.

28. C. INAEQUALIS *Fr.*, Syst. Myc. i. p. 481; Cotton in Trans. Brit. Myc. Soc. ii. 1906, pp. 163–165, and iii. 1907, p. 33.

C. inaequalis Müller, Fl. Dan. tab. 836, fig. 1; *C. polymorpha rufa* Müll. Fl. Dan. tab. 775, fig. 1; *C. rufa* Pers., Comment. p. 71; *C. fasciculata* Villars, Hist. Pl. Dauph. iv. 1789, p. 1052; *C. bifurca* Bull., Ch. Fr. tab. 264; *C. angustata* Pers., Comment. p. 72; *C. vermiculata* Sow., Col. Fig. tab. 253, p.p.; *C. dissipabilis* Britz., Hymenomycet. aus Südbayern, 1885, p. 289; *C. similis* Boud. et Pat., Journ. de Bot. ii. 1888, p. 446.

Illustrations: Flor. Dan. tab. 836, fig. 1; Boud. et Pat., loc. cit. tab. 8, fig. 1; Britzelmayr, loc. cit. fig. 28; Bulliard, loc. cit.; Cotton in Trans. Brit. Myc. Soc. iii. tab. 11, fig. B (spores); Greville, Scott. Crypt. Flor. i. tab. 37 (*C. fragilis*); Massee, Brit. Fung. Flor. i. p. 74, fig. 4; Pers., Comm. tab. 1, fig. 3 *bis* (*C. angustata*); Sowerby, Col. Fig. tab. 253 (lower figs.).

Plants simple, or very rarely with one or two branchlets, 4–7·5 cm. high, usually in small groups but occasionally single. *Clubs* cylindrical or flattened, smooth or with one or more furrows, bright yellow to rich orange, apex obtuse or pointed. *Stem* not distinct. *Flesh* whitish, fibrous. *Basidia* conspicuous, clavate, yellowish, 30–40 × 6–8μ; sterigmata 4, more or less erect. *Spores* hyaline, white or slightly ochraceous in the mass, subglobose, sharply warted, 5–6 (–8)μ in diameter.

Habitat. Amongst grass in woods, parks, lawns, etc. Common.

This is by far the most frequent of the yellow simple Clavarias, being found in short grass in a variety of situations every season. It may be distinguished at once from all other yellow species by its subglobose, spiny spores.

As pointed out in the notes in Trans. Brit. Myc. Soc. ii. p. 163, *C. dissipabilis* Britz. is merely a synonym of *C. inaequalis.* The only justification for Britzelmayr's describing his plant as a new species was Karsten's statement that the spores of *C. inaequalis* were smooth and elliptical. This was an error, as the examination of material in herbaria, including Karsten's own specimens, clearly shows. It is possible that a species with smooth elliptical spores occurs on the Continent, but if so it is obviously very rare and cannot be regarded as representing the old and well-known *C. inaequalis.*

Dark forms of this species, almost orange in colour, sometimes occur, and these represent the *C. polymorpha rufa* (= *C. rufa* Pers.) of the Flora Danica. (See Trans. Brit. Myc. Soc. iii. p. 33.)

29. C. STRAMINEA *Cotton*, in Trans. Brit. Myc. Soc. iii. 1910, p. 265.

Illustrations: Cotton, loc. cit. tab. 11, fig. D (given in error as *C. persimilis*).

Plants small, unbranched, isolated or caespitose, straw-coloured, becoming brownish with age; smell and taste not marked. *Clubs* slender, 3–5 cm. high, 3–4 mm. thick, cylindrical or somewhat compressed, smooth, brittle, apex usually acute. *Stem* usually very distinct, cinnamon-yellow. *Flesh* somewhat darker than the hymenium. *Internal structure* pseudoparenchymatous in transverse section. *Basidia* rather large, 40–60 × 7–9μ, contents granular, sterigmata 4. *Spores* hyaline, smooth, globose, with a minute basal apiculus, 5–7μ in diameter, contents granular.

Habitat. In short grass. Rare. Specimens from Erringden, near Halifax (C. Crossland, 1905); Carlisle (Miss D. Graham, 1908–1909); Chatsworth (A. D. C., 1909); Broseley, Salop (G. Potts, 1909); Clare Island (A. D. C., 1910); Sandsend, Yorks. (C. Crossland, 1912); Haslemere (E. M. W., 1913).

C. straminea differs from *C. argillacea* in its smaller size, and pointed cylindrical clubs, and also in its globose spores. In both species the spore-bearing surface is paler in colour than the stem, and is more or less clearly separated from it. In *C. argillacea* the stem is yellow or greenish-yellow, whereas in *C. straminea* it becomes a brownish-red or cinnamon, and this colour is liable, especially on handling, to spread over the whole surface of the club.

C. flavipes Pers., in Fries, Syst. Myc. i. p. 483, might possibly refer to this species, but no specimen exists, and its identity cannot be determined from the description and figures quoted.

30. C. ARGILLACEA *Fr.*, Syst. Myc. i. p. 482.

C. argillacea Pers., Comment. p. 74; *C. ericetorum* Pers., Obs. Myc. ii. 1799, p. 60.

Illustrations: Boudier, Icon. Mycol. i. tab. 175; Fries, Obs. Myc. ii. tab. 5, fig. 3; Pat., Tab. Anal. fig. 585, *non* 587.

Plants simple, gregarious, 2–5 cm. high, pale greenish-yellow, fragile; smell none, taste like tallow. *Clubs* cylindrical or flattened, with one or more grooves, surface often minutely channelled, apex blunt. *Stem* distinct, yellowish. *Internal structure* almost pseudoparenchymatous in transverse section, even when old; cells regular, 10–14μ in diameter, with small narrow filaments (4–5μ in diameter) between; segments 50–70μ long towards the margin, but up to 200–300μ in the centre. *Basidia* conspicuous, about 70μ long, contents granular, sterigmata 4. *Spores* smooth, hyaline, cylindric to elliptical with a minute lateral basal apiculus, 10–11 × 5–6μ (or sometimes 10–14 × 6–7μ), contents granular.

Habitat. In heathy places. Not uncommon.

This species is a typical plant of heather moors and similar heathy places, on which it at times occurs in profusion and occasionally in company with *C. tenuipes*. The only species with which it is likely to be confused is *C. straminea*, which as stated in the remarks under that species differs in its globose spores and other characters.

31. C. LUTEO-ALBA *Rea*, in Trans. Brit. Myc. Soc. ii. 1903, p. 66; Cotton, ibid. iii. 1907, pp. 30–31, 183.

Illustrations: Trans. Brit. Myc. Soc. ii. 1903, tab. 3, fig. B; Ibid. iii. 1907, tab. 11, fig. C (spores).

Plants simple, isolated or in two's or three's, small, 3–5 cm. high; smell none, taste like tallow. *Clubs* very slender, 1·5–3 mm. thick, apricot-yellow with apex whitish, cylindrical or slightly compressed, smooth, solid, usually attenuated, apex acute or obtuse. *Stem* not sharply marked, often becoming more distinct on drying. *Flesh* orange-yellow. *Internal structure* not pseudoparenchymatous in transverse section, but composed of loosely packed longitudinally running filaments, 5–6 μ in diameter, containing orange-coloured granules. *Basidia* small, 25–30 × 5–7 μ, contents slightly granular; sterigmata 4, erect. *Spores* hyaline, smooth, ovoid or slightly pip-shaped, not apiculate, 6–8 × 3–4 μ (average 6–7 × 3 μ).

Habitat. In short grass, on mossy banks, etc. Not uncommon.

The species is distinguished from *C. inaequalis* by its small size and apricot-yellow clubs, with the apex not infrequently white. The flesh also is practically identical in colour with the exterior of the club, whereas in *C. inaequalis* the flesh is whitish. The smooth ovoid spores moreover distinguish it. On drying the plant rapidly loses its apricot hue, and finally becomes pale ochraceous, the stem usually retaining the colour longer than the club, and becoming twisted. The white apex from which the plant takes its name is more marked in some cases than in others, and may be altogether absent; it appears to be more obvious in the field, and disappears on drying.

Some remarkably large specimens were found growing amongst holly leaves at Haslemere. These plants grew in clusters or singly, with the habit and markings of *C. rugosa*. The spores were 7–10 × 4–5 μ (average 8 × 4 μ), slightly larger than those of typical *C. luteo-alba*, but the colour of the clubs and flesh was normal.

32. C. PERSIMILIS *Cotton*, in Trans. Brit. Myc. Soc. iii. 1909, p. 182.

Illustrations: None published.

Plants small unbranched, isolated or fasciculate, orange-yellow to orange, becoming darker on drying. *Clubs* slender, 3–5 cm. high, 2–3 mm. thick, cylindrical or somewhat compressed, apex usually acute. *Stem* not sharply defined. *Flesh* pale. *Internal structure* composed of loosely packed, longitudinally running filaments 3–6 μ in diameter, not pseudoparenchymatous in transverse section. *Basidia* small, 30–35 × 7–8 μ, contents granular; sterigmata 4, erect. *Spores* smooth, hyaline, subglobose to oblong, with a conspicuous lateral oblique apiculus, 5–6 × 4 μ, guttulate.

Habitat. In short grass. Not uncommon.

The present species is very similar to *C. luteo-alba* Rea, and difficult to distinguish from it in the field. An unfailing character is found in the spore, which is subglobose to oblong with a very well-marked oblique apiculus, and not ovoid and non-apiculate as in *C. luteo-alba*. It differs also in other characters, namely, in the different shade of colour when fresh, the absence of a white tip, and in becoming dark orange on drying.

(*e*) Plants ochraceous to brownish.

33. C. PISTILLARIS *Fr.*, Syst. Myc. i. p. 477.

C. pistillaris Linn., Flor. Suec. p. 456, No. 1266 (1755); *Fungus clavatus* Bocc. ex Fries, loc. cit.; *C. major* Mich., Gen. Plant. tab. 87, fig. 1; *C. herculeana* Lightfoot, Fl. Scot. ii. 1777, p. 1056; Pers., Comment. p. 63; *C. pulvinata* Pers., Comment. p. 65.

Illustrations: Numerous. Atkinson, Mushrooms, p. 202, fig. 203; Bulliard, Ch. Fr. tab. 244; Hussey, Illustr. Brit. Mycol. i. tab. 62; Massee, Brit. Fung. Flor. i. p. 74, fig. 8; Sowerby, Col. Fig. tab. 277; Migula in Thomé, Flora von Deutschl. iii. 2, 1, tab. 24; Weberbauer, Pilze, tab. 11, fig. 3.

Plants simple, solitary, clavate or obovate, variable in size, 10–30 cm. high, 2·5–5 cm. thick at the widest part. *Clubs* minutely velvety, whitish then dingy ochraceous, finally dusky brown, stuffed. *Stem* not distinct. *Flesh* whitish, loose and cottony in the centre. *Basidia* about 70μ long, with 2–4 sterigmata. *Spores* smooth, ochraceous in the mass, almost hyaline by transmitted light, elliptic-oblong, with oblique basal apiculus, 12–16 × 7–8μ.

Habitat. On the ground in woods. Rather rare and sporadic.

Easily distinguished by the large, thick, club-shaped sporophores.

34. C. LIGULA *Fr.*, Syst. Myc. i. p. 477.

C. ligula Schaeff., Icon. Fung. tab. 171; *C. caespitosa* Wulf., in Jacq. Misc. 2, 1781, p. 98, tab. 12, fig. 2; *C. pulvinata* Pers., Comment. p. 65; *C. luteola* Pers., Comment. p. 66.

Illustrations: Flor. Dan. tab. 837, fig. 1; Schaeff., loc. cit.; Migula in Thomé, Flora von Deutschl. iii. 2, 1, tab. 24 B, fig. 1; Weberbauer, Pilze, tab. 11, fig. 4.

Plants simple, clavate, 5–10 cm. high, up to 1·25 cm. thick above, much narrowed and downy towards the base, ochraceous with a rufescent tinge, fragile, apex rounded. *Stem* not distinct from the club. *Flesh* solid. *Basidia* conspicuous, 40 × 6–8μ; sterigmata 4. *Spores* smooth, hyaline, cylindrical or very narrowly elliptical, with a curved basal apiculus, 11–14 × 4μ.

Habitat. Attached by the downy base to leaves, twigs, etc., lying on the ground in woods. Very rare. Specimen from Duncombe Park near Helmsley (Y. N. U. Foray, Sept. 1903).

This species is allied to *C. pistillaris*, but differs in the flattened and much smaller clubs and pale colour. It is apparently very rare in Britain as no specimens have been received during the past 15 years. Specimens, however, were forwarded by Mr. C. G. Lloyd from Sweden and Mr. W. B. Allen from Germany.

35. C. FISTULOSA *Fr.*, Syst. Myc. i. p. 479; Lind in Ann. Myc. v. 1907, p. 272.

C. fistulosa Holmsk., Beata ruris, 1790, p. 15, tab. 6; *C. pilipes* Müll., Flor. Dan. tab. 1076, fig. 1; *C. Ardenia* Sow., Col. Fig. tab. 215; *C. strigosa* Schum., Enum. Pl. Saell. 1801, p. 403; *C. macrorhiza* Sw., Vet. Ak. Handl. 1811, tab. 6, fig. 1.

Illustrations: Holmskiold, Fung. Dan. i. 1799, tab. 6; Harper in Mycologia, x. 1918, tabs. 3, 4, figs. A, B; Flora Danica, tab. 1076, fig. 1, tab. 1256; Sowerby, loc. cit.; Migula in Thomé, Flora von Deutschl. iii. 2, 1, tab. 24 B, fig. 2.

Plants simple, solitary or two to three together, erect, tough, narrowly clavate, 5–8 cm. high or more; smell and taste none. *Clubs* at first yellowish, then date-brown, cylindrical or clavate, often twisted, smooth, hollow with age, occasionally branching at the apex. *Stem* with whitish fibrils. *Flesh* not distinct in colour. *Internal structure* characterised by possessing a system of laticiferous hyphae, unseptate, frequently branched, 6μ in diameter, contents granular. *Basidia* conspicuous, about 40μ long, contents finely granular; sterigmata 4, erect. *Spores* hyaline, smooth, pip-shaped, with often irregular outline, 10–17 × 7–9μ (average 13–15 × 8μ), contents guttulate or granular.

Habitat. On fallen branches lying amongst dead leaves. Rare.

According to Lind, in Denmark this species occurs chiefly on branches of beech, whereas *C. contorta* is usually on alder. Harper, however, finds *C. fistulosa* always on sticks buried amongst leaves in coniferous woods. Both writers agree that the spores of *C. fistulosa* are smaller than those of *C. contorta*, and this observation is borne out in the British specimens examined.

36. C. CONTORTA *Fr.*, Syst. Myc. i. p. 478; Lind in Ann. Myc. v. 1907, p. 272; Cotton in Trans. Brit. Myc. Soc. ii. 1906, p. 165, and iii. 1910, p. 266.

C. contorta Holmsk., Beata ruris, 1790, p. 29, tab. 12; *Tremella ferruginea* Schum., Enum. Pl. Saell. 1801, p. 443.

Illustrations: Holmskiold, loc. cit. tab. 12; Flora Danica, tab. 1852, fig. 1; Harper in Mycologia, x. 1918, tab. 4, fig. C; Boudier in Bull. Soc. Myc. Fr. xxxiii. 1917, tab. 1, fig. 5.

Plants erumpent, 2–3 cm. high, contorted, irregularly branched; smell and taste none. *Clubs* pale yellowish-drab, darker when moist, fairly tough; branches 4–6 mm. thick, short, blunt, wrinkled, not attenuated, at length hollow. *Stem* not distinct. *Internal structure* in longitudinal section of long cells 10–15μ wide, with narrower elements on either side; latex-tubes present. *Basidia* rather large, very distinct, 50 × 10μ, contents finely granular; sterigmata 4. *Spores* hyaline, smooth, ovate or pip-shaped, pointed at the base, 17–23 × 8–10μ (average 19 × 9μ), contents vacuolate.

Habitat. On branches of *Alnus*. Rare.

As pointed out in the notes in these Transactions referred to above, von Höhnel regards *C. contorta* as a morbid form of *C. fistulosa*, but this statement has been criticised by Lind. Lind's arguments appear to be confirmed by what is known of British specimens. In the paper quoted he gives a tabular comparison of the differences between *C. contorta* and *C. fistulosa*, stating that he knows both species well and finds no intermediate forms. The chief points of distinction in *C. contorta*, besides its dwarf, fasciculate habit, are its paler, more greyish colour, entirely smooth club, covered everywhere with the hymenium, its occurrence on dead branches still remaining on the tree, as well as on fallen ones, preference for *Alnus incana*, and larger spores.

37. C. JUNCEA *Fr.*, Syst. Myc. i. p. 479; Harper in Mycologia, x. 1918, p. 56.

C. juncea Fr., Obs. ii. p. 291; *C. cylindrica* Tode, in Schrift. Naturf. Freund. Berl. iv. 1783, p. 166; *C. triuncialis* Pers., Comment. p. 82; *C. triuncialis* f. *juncea* Alb. et Schw., Consp. Fung. p. 289; *C. hirta* Vahl, Flor. Dan. tab. 1257; *Typhula juncea* Schroet., Pilz. Schles. i. p. 441.

Illustrations: Boudier, Icon. Mycol. i. tab. 176; Harper, loc. cit. tab. 5.

Plants filiform, simple, in groups of two or three, dirty yellow, then tinged rusty, or brownish-drab; smell none; taste distinctly acrid. *Clubs* slender, weak, wavy, not brittle, 8–12·5 cm. high, 0·5–1·5 mm. thick, apex pointed. *Stem* long, up to 2 mm. thick, woolly. *Flesh* uniform. *Internal structure* in transverse section pseudoparenchymatous throughout, with occasional large air-spaces. *Basidia* small, 30–35 × 6–7 (–8) μ, slightly vacuolar; sterigmata 4. *Spores* smooth, hyaline, elliptical and slightly curved, or pip-shaped, with oblique apiculus, 8-11 × 4–5μ.

Habitat. On dead, fallen leaves, etc. Rare. Specimens from Broseley, Salop (W. B. Allen and G. Potts, 1909); Louisburgh (H. C. Hawley, 1910); Mulgrave Woods, Yorks. (Y.N.U. Foray, 1912).

This species is related to *C. fistulosa*, but differs in the very much more slender habit.

SPECIES NOBIS INCOGNITAE.

CLAVARIA MICHELII *Rea*, in Trans. Brit. Myc. Soc. ii. 1902, p. 39.

C. fragilis Holmsk. var. *C. gracilis* Pers., Fr. Hym. Eur. p. 675.

On ground, Dinmore, C. Rea, 1902.

This is a simple yellow species, said to have subglobose spores, 3 × 2μ. It differs in this respect from any of the yellow species with which we are familiar.

C. SUBTILIS (*Pers.*) *Fr.*, Syst. Myc. i. p. 475; Rea in Trans. Brit. Myc. Soc. ii. 1902, p. 39.

Tough, thin, white, becoming yellowish, glabrous at the base, of equal thickness throughout (1 mm.), branches few, dichotomously forked and somewhat fastigiate. Spores white, elliptical, 6 × 3μ. The whole plant is 2–2·5 cm. high.

Amongst grass, Moseley Green, Forest of Dean, C. Rea, 1902. Distinguished from allied species by its small size, equality of thickness, toughness and few branches.

The above is the description given by Rea. Amongst the as yet unidentified material which has come into our hands there is a slender whitish or pale yellow branched species, sent by Miss Lister from Theydon Forest, which would pass very well for this species as regards habit, but the spores are subglobose, 3μ, hence it cannot be regarded as identical.

C. TENERRIMA *Mass. et Crossland*, in Naturalist, 1904, p. 2.

Gregaria subtenax farcta candida; clavis simplicibus cylindricis flexuosis apice subattenuatis; sporis hyalinis subglobosis apiculatis verrucosis, 8–9μ

Sporophores entirely shining white, gregarious but quite distinct at the base, cylindrical, smooth, apex slightly attenuated but by no means acute, base not narrowed, 2·5–4 cm. high, 1·5–2 mm. thick. Basidia bearing four spores.

Said to be characterised by the slender, cylindrical, flexuous sporophore, and more especially by the subglobose spores having the epispore densely covered by minute rounded warts.

Unfortunately the type specimen does not appear to have been kept. The only white species with rough spores seen by the authors has spores with quite distinct, comparatively long spines, and is obviously *C. asterospora* Pat. The suspicion arises that *C. tenerrima* may have been really *C. acuta*, the spores of which have granular contents, and might have appeared to be rough.

SPECIES EXCLUDENDAE.

C. Ardenia Sow., Col. Fig. tab. 215. = *C. fistulosa.*

C. aurea Fr., Epicr. p. 574. None of the British specimens seen can be satisfactorily distinguished from *C. flava.* The statement by Fries that *C. aurea* differs from *C. flava* in its coloured spores cannot be maintained, since as already pointed out the spores of all in this section are coloured. The further distinction of habitat is of no value, as *C. flava* occurs in both coniferous and frondose woods.

C. canaliculata Fr., Obs. 2, p. 294. = *C. rugosa.*

C. chionea Pers., Myc. Eur. i. p. 167. = *C. Kunzei.*

C. ceranoides Pers., Syn. p. 594. This was founded on Sowerby, tab. 235, which is obviously a form of *C. fusiformis.*

C. coralloides Linn., Flor. Suec., ed. 2, 1755, p. 457. At first applied to various branched species, but the name appears to have been used by Fries and others for large forms of *C. cristata.*

C. condensata Fr., Epicr. p. 575. Indeterminable.

C. crassa Britz., Hymenomycet. aus Südbayern, 1885, p. 286. Has the form and spores of *C. rugosa,* but was said to be tinged violet. Probably = *C. rugosa.*

C. crispula Fr., Syst. Myc. i. p. 470. Indeterminable.

C. crocea Pers., Icon. et Descr. p. 36, tab. 11, fig. 6. Indeterminable.

C. curta Fr., Monogr. ii. p. 281. Indeterminable.

C. dissipabilis Britz., Hymenomycet. aus Südbayern, 1885, p. 289. = *C. inaequalis.*

C. falcata Pers., Comment. p. 81. = *C. acuta*? (See these Trans. iii. p. 32.)

C. filicina Sacc. et Syd., Syll. xiv. p. 238; *C. cervina* W. G. Smith, in Journ. of Bot. 1873, p. 66. Apparently a good species, but doubtless an introduced plant, and therefore not included in this account of British forms.

C. flavipes Pers., Comment. p. 75. Indeterminable. (See these Trans. iii. p. 266.)

C. fragilis Holmsk., Beata ruris, p. 7, tabs. 2 and 3. The right-hand figure of tab. 2 is *C. vermicularis.* The other simple white forms in tab. 2 and the yellow forms in tab. 3 are not identifiable with certainty from the figures alone, and the name should be dropped.

C. grisea Pers., Comment. p. 44. = *C. cinerea.* (See these Trans. iii. 1909, p. 184.)

C. Kewensis Mass., in Journ. Bot. 34, 1896, p. 470. = *C. stricta.*

C. Krombholzii Fr., Epicr. p. 572. The figures of Krombholz on which this species was founded may have been forms of either *C. Kunzei* or *C. rugosa*, possibly both. No species distinct from either that would answer to *C. Krombholzii* has been seen by the authors.

C. pyxidata Pers., Comment. p. 47, tab. 1, fig. 1. Possibly an abnormal form of *C. stricta*, since it occurred on wood.

C. rufa Pers., Comment. p. 71. = *C. inaequalis.* (See these Trans. iii. p. 33.)

C. rufescens Schaeff., Icon. Fung. tab. 288. = *C. botrytis.*

C. spinulosa Pers., Obs. Myc. 2, p. 59, tab. 8, fig. 1. Indeterminable.

C. striata Pers.; Persoon's figure suggests a discoloured *C. vermicularis.*

C. tuberosa Sow., Col. Fig. tab. 199. The figure suggests an abnormal form of *C. fistulosa*, but was referred by Fries and Quélet to the genus *Calocera*. Probably not determinable.

C. uncialis Grev. = *Pistillaria.*

THE OCCURRENCE OF OAK MILDEW ON BEECH IN BRITAIN.

By A. D. Cotton, F.L.S.

The fungus which now so generally occurs on coppiced oak in this country was first noticed in Europe in 1907 and was probably introduced from America. Its spread in Europe was remarkably rapid and by 1909 it was known from almost every European country and had moreover spread through Turkey into Asia Minor.

The fungus for a time remained unnamed since, owing to the absence of perithecia, it was impossible to determine its generic position. In 1910 Griffon and Maublanc named the conidial stage *Oidium alphitoides*, and the following year Arnaud and Foëx recorded the occurrence of occasional perithecia production from which it was apparent that the fungus was a *Microsphaera*, and was regarded by them as a form of *M. Alni*. This view has in the main received acceptance and is endorsed